Thorup 1999-0467A

REMARKS

On December 28, 2004 a short telephone interview was conducted with the Examiner. The courtesy extended by the Examiner is greatly appreciated.

Claim 27 was rejected under 35 USC 112, second paragraph. The claim is amended to correct an antecedence error and, as amended, it is believed that the claim overcomes the rejection.

As for the rejections on art, claims 21 and 22 were rejected under 35 USC102 as being unpatentable over Sui et al, US Patent 6,359,861. This is a new rejection, whereas the remaining claim rejections are repeats of the rejections in the previous Office Action, to which applicants responded. The Examiner's view is that applicants' arguments are not persuasive. The following is a second, it is hoped more persuasive, attempt.

Claims 1 and 2 were rejected under 35 USC 103 as being unpatentable over Morrison et al, US Patent 5,854,903 in view of Frigioni et al, "Experimental Analysis of Dynamic Algorithms for the Single Source Shortest Paths problem," ACM Press, Article 5, pages 1-3, 5-6, 1998. Applicants respectfully traverse.

In rebuttal to applicants' various arguments the Examiner quotes from col. 5, lines 58-65, asserting that "Morrison states:

> 'the focus of the method of the invention in this embodiment is the sizing and routing of virtual paths within a multi-service network (specified between origin and destination) and the determination of rates of traffic offered to various routes connecting origin-destination node pairs, for the achievement of optimum network performance'".

Following the purported quote the Examiner asserts that the implied weights of Morrison et al are equated to applicants' costs, and goes on to explain what the Examiner considers the definition of "routing" to be.

Alas, the Examiner's purported quote contains an error in that the parenthetical expression in the Frigioni et al reference actually states "<u>where each virtual path is associated with a particular service offered between the</u> specified origin and destination" (the underlined portion is missing in the Examiner's quote). Applicants agree that the focus in the Morrison et al reference is on (1) sizing (2) routing, and (3) virtual paths. Sizing of virtual paths means determining or setting the *size* of the path (in contrast to links) – from an origin to a destination - relative to a particular type of service; i.e., how many calls can be carried simultaneously over the path. Routing of virtual paths means

determining or setting the different links and nodes of the network that *make up* the path from a given origin to a given destination, for a particular type of service. There seems to be no disagreement with the Examiner in connection with what "sizing" and "routing" means in the context used by Morrison et al.

It is respectfully submitted that neither the notion of sizing virtual paths nor the notion of routing of virtual paths speaks of implied costs. Moreover, the Examiner's assertion that the implied weights correspond to applicants' costs is not something that applicants had rejected in their response but, rather, applicants asserted that the correspondence of the implied weights to applicants' costs *per se* does not render applicants' claims unpatentable.

Reviewing the teachings of Morrison et al again -- starting with the text quoted by the Examiner -- applicants agree that the focus of the Morrison et al methodology is the sizing of virtual paths (how large should each path be set to be) and the routing of virtual paths (which nodes and links should the virtual paths traverse). To do this intelligently one must construct a measure of goodness that is maximized, or a measure of cost that is minimized.

In col. 6, lines 41-44 Morrison et al teach that network revenues is used as a proxy for network performance. The "sensitivity of the network performance" notion that is preferred by Morrison et al "utilizes the notion of implied costs," and to know what the performance of the network is, Morrison et al employ implied costs. Morrison et al also teach, in col. 6, lines 61-62, that to evaluate the implied costs one is faced with a task with $O(S^3L^3)$ complexity. This realization is repeated in column 12 where the equation for the implied costs – equation 3.10 – is expressed, and Morrison et al note in col. 12, lines 35-36 that the exact solution is on the order of S^3L^3.

In col. 9, lines 5-10 it is stated:

> In the optimization algorithm, the network is analyzed to obtain W and $\partial W / \partial \rho_{sr}$, using the techniques described herein and in more detain in the section following. The steepest ascent direction is then computed by projecting $\partial W / \partial \rho_{sr}$ on to the null space of (2.5)

which is part of the Morrison et al uniform asymptotic approximation (UAA). That, apparently, circumvents the $O(S^3L^3)$ problem because, as taught in col. 6, line 66 – col. 7, line 11, by applying the UAA,

> the complexity of solving these implied cost equations is reduced to $O(L^3)$,

and that is

> a key advantage of the method of the invention.

The same view is expressed by Morrison et al earlier in the specification where, in col. 6, lines 4-6, Morrison et al state that a:

> principle aspect of the methodology of the invention is the systematic incorporation of asymptotics in various stages of the multirate network design,

and in col. 6, lines 10-11, it is taught that

> a central element in the asymptotic approach is the uniform asymptotic approximation (UAA).

Thus, it is clear that (a) Morrison et al endeavor to optimally size and route virtual paths through an algorithm that maximizes network revenue, (b) that a steepest ascent algorithm is used, (c) that the sensitivity of the network revenue to implied costs ($\partial W / \partial \rho_{sr}$) is used as the measure for performing the steepest ascent, (d) that actually evaluating the implied costs results in a $O(S^3L^3)$ problem, (e) that an asymptotic approximation technique where $\partial W / \partial \rho_{sr}$ is used reduces the problem to $O(S^3)$, and (f) that the use of the asymptotic technique is considered by Morrison et al to be a key advantage of their invention and a principle focus of their method.

Based on the above it is believed that the following conclusions are appropriate:

1. A suggestion that the asymptotic steepest ascent approach should be abandoned in favor of some other approach is tantamount to an abandonment of a *principle aspect* of the Morrison et al invention.

   (a) It is respectfully submitted that no skilled artisan would modify the Morrison et al invention by abandoning its principle aspect without some realization that this principle aspect of the method is somehow faulty.

   (b) If a given method were to be considered deficient enough to abandon its principal aspect, a skilled artisan would simply not use the method.

   (c) If a given method's principle aspect were to be abandoned and replaced with something else it is not a foregone conclusion that the method would continue to work, or work as well.

(d) In short, particularly in the absence of a realization that the Morrison et al approach is deficient and can be improved, there is no motivation for replacing the asymptotic steepest ascent approach – which is the principle aspect of the Morrison et al method – with any other significantly different approach.

2. Regarding the steepest ascent technique, which is the method used by Morrison et al, the Examiner's attention is respectfully directed to page 12 of the instant specification where, at the paragraph that begins at line 6, the "steepest descent" approach is distinguished from the "best neighbor" approach. Applicants' specification teaches that the best neighbor approach is superior to the steepest descent approach because it does not get stuck at a local minimum, whereas the steepest descent approach can.

With reference to claim 1, it is clear that Morrison et al do not use a "best neighbor" approach, and the Examiner admits this fact. The Examiner asserts, however, that Frigioni et al teach

> a best-neighbor approach (Page 6, 1st paragraph; Dijkstra algorithm)
>
> Frigioni further teaches that using the dynamic Dijkstra algorithm requires minimum computation by not computing the entire table from scratch at each iteration (Frigioni, Page 1, 2nd Paragraph).

In the aforementioned telephone interview the Examiner clarified that, in the Examiner's view, the Dijkstra algorithm is a best-neighbor approach algorithm.

Applicants respectfully disagree.

At page 11 the instant specification describes the notion of a "local search technique." It clearly specifies (page 11, lines 18-22) that

> a <u>local search technique</u> is any approach that, for a given vector **W(A)**, considers only those neighboring states closely surrounding **W(A)**and steps to one of those neighboring states. Each state allowable point immediately surrounding a vector **W(A)**is referred to as a "neighbor" or "neighboring state" of **W(A)**and each "adaptation step" from **W(A)** will generally progress to one of its neighboring states. (underlining supplied for emphasis)

The specification then teaches (page 11, lines 24-26) that a "descent approach" is a class of local search approaches that

> search for a minimum by searching for one or more available neighboring states above a vector **W(A)**, evaluates the cost of the neighboring states and adapts to one of the neighboring states that

> reflects a <u>lower</u> cost than vector **W(A)**. (underlining supplied for emphasis)

Thereafter, the specification teaches (page 11, lines 28-29) that the steepest-descent approach is a descent approach that, at each adaptation stage

> will move from **W(A)** to the neighboring state that reflects the lowest cost. (underlining supplied for emphasis)

Finally, the specification teaches (page 12, lines 6-10) that

> A variation of the steepest-descent approach is the "best-neighbor" approach. A best-neighbor approach, like a steepest descent approach, will search for the neighboring state having the best, i.e., lowest, cost. However, unlike the steepest-descent approach, the best-neighbor approach is not limited to moving downhill on a performance surface but can alternatively move to neighboring states reflecting an equal or even higher costs.

Thus, what the specification teaches is a classification hierarchy. The "local search" approach is at the top of the classification tree (level I). The "descent" approach is at level II, and the "steepest-descent" approach is at level III. The "best-neighbor" approach, being a variation of the steepest descent approach, is at level IV.

It is respectfully submitted that the term "best-neighbor" approach is a term whose meaning is specified in the instant specification, and the ascribed meaning is not in conflict with any established use of the terms. Moreover, it is respectfully submitted that the term "best neighbor" is not used in the art to describe the Dijkstra approach.

In fact, the Dijkstra algorithm is a local search approach, but it is NOT a descent approach. It certainly is not a "steepest descent" approach, and even more surely it is not a "best-neighbor" approach.

Moreover, even if Frigioni et al were teaching the best-neighbor approaches, it remains that, as demonstrated above, there is no motivation for modifying the Morrison et al reference by discarding the steepest ascent approach for a best-neighbor approach, (a primary aim of which is to not get stuck in a local minimum). Morrison et al did not address the problem of being "stuck" at a local minimum, and the Frigioni et al reference does not even encounter this problem because it is not a descent approach.

In view of the above, it is respectfully submitted that claim 1 is not obvious in view of the Morrison et al and Frigioni et al combination of references.

Thorup 1999-0467A

Claim 2 depends on claim 1 and is, therefore, believed not obvious in view of the Morrison et al and Frigioni et al combination of references.

In reviewing the claim in the course of preparing the instant response, a typographical error was discovered and it is corrected herein. It is respectfully submitted that amended claim 2 is not of different scope than then unamended claim 2, and that both are patentable over the references because (a) they depend on claim 1, and (b) the claim defines use of an anti-cycling technique that is not described by any of the reference.

On connection with claim 2, the Examiner asserts that the Dijkstra algorithm is inherently anti-cycling, but this is because the Dijkstra algorithm does not embody a descent approach at all and, therefore, is not subject to cycling. In any event, it cannot be said that the Dijkstra algorithm "uses at least an anti-cycling technique" (emphasis supplied) since, by the Examiner's own assertion, it inherently does not suffer from cycling.

Claims 3, 6, 9, 10, and 12 were rejected under 35 USC 103 as being unpatentable over Morrison et al in view of Frigioni et al and US Patent 6,192,043 issued to Rochberger. Applicants respectfully traverse.

The Examiner admits that neither Morrison et al nor Frigioni et al teach the "impatience" technique, but asserts that Rochberger teaches a best-neighbor approach with an impatience technique. Respectfully, that is not the case. Rochberger teaches the Dijkstra algorithm with an implementation improvement. Whether this improvement is tantamount to an impatience algorithm is irrelevant, since the Dijkstra algorithm (as demonstrated above) is NOT a best-neighbor approach.

In contradistinction, claim 3 depends on claim 1, it specifies that the best neighbor approach is used, and that the best neighbor approach that is used uses an impatience technique. Therefore, it is believed that claim 3 is not obvious in view of the Morrison et al, Frigioni et al and Rochberger combination of references.

Claim 6 is patentable for the same rationale that applies to claim 3, and applicants respectfully submit that claim 6 is even more clearly patentable because it employs both the impatience and the anti-cycling techniques.

Claim 9 depends on claim 6 and further specifies that the cost function is piece-wise linear. The Examiner asserts that Morrison et al teach a piece-wise linear cost function, and in support of this assertion the Examiner cites col. 15, lines 1-5, col. 12, lines 1-10, and col. 9, lines 16-25. Applicants respectfully disagree. None of the cited passages teach, and nowhere else in the reference is there a teaching, that the network revenue (which is the Morrison et al cost function) is piece-wise linear. In fact, none of the cited passages characterize the cost function, and none of the cited references teach that anything else is piece-wise linear.

A piece-wise linear function is, by definition, a function where at different ranges of the independent variable a dependent variable is linearly related to the independent variable; i.e., in each range, the function is depictable by a line of some slope. None of the cited passages describe such a function. In col. 9, lines 16-25, Morrison et al effectively define the variables used in the method, and their minimum and maximum extends, and proceed to specify the first step of the algorithm the network. In col. 12, lines 1-10, Morrison et al present an equation for the sensitivity of the revenue, W, with respect to the offered load, but that equation is NOT piece-wise linear. In col. 15, lines 1-5, Morrison et al teach that equation 3.10 gives the system of linear equations satisfied by the implied costs, but this also is not a teaching of anything that is piece-wise linear.

In short, it is believed that claim 9, which depends on claim 6 and is believed patentable by virtue of this dependence, is even more clearly patentable by virtue of the defined limitation relative to the notice of the cost function.

Claim 10 specifies in more detail the claim 3 method, and claim 12 is dependent on claim 10. It is believed that for the reasons expressed in connection with claim 3, claims 10 and 12 are patentable.

Claims 4 and 5 were rejected under 35 USC 103 as unpatentable over Morrison et al in view of Frigioni et al and further in view of Kume et al. Applicants respectfully traverse.

In connection with claim 4 the Examiner admits that neither Morrison et al nor Frigioni et al teach a diversification method, but asserts that Kume et al do. Applicants respectfully traverse. The Kume et al reference is in a wholly different art. It relates to retransmissions in response to collision detections. It has nothing to do with

diversification in the context of finding a minimum cost solution in the context of a multi-dimensional cost function, and the process of randomly jumping from one region of the cost function to another region of the cost function. The teachings of Kume et al are simply not applicable to the problem to be solved by Morrison et al.

It is respectfully submitted that the Examiner's assertion that

> it would have been obvious at the time of the invention to one of ordinary skill in the art to create the method for controlling traffic flow in a network with a best neighbor approach as taught by Morrison and Frigioni while using the diversification process as taught by Kume in order to reduce the number of packet collision and the percentage of channel utilization is increased

is without merit. The Morrison et al problem pertains to the sizing and routing of virtual paths – an activity that precedes the sending of data. It has nothing to do with what happens when data is sent and, in particular, it has nothing to do with what happens when data needs to be sent and there is not enough capacity. Also, there is no teaching or suggestion in Morrison et al that packet collisions might occur, or that the Morrison et al method deals with anything other than circuits that, once established, can send their allocated bandwidth of packets without fear of collisions.

Accordingly, it is believed that claim 4 is not obvious in view of the Morrison et al, Frigioni et al, and Kume et al combination of references.

Claim 5 depends on claim 4 and specifies that the diversification is of a limited range. In the context of applicants claim, where a minimum is sought to be identified in a multi-dimensional cost function, a limited range diversification technique moves the point under consideration by a limited distance. This is <u>totally different</u> from a retransmission delay that is based on a random value obtained from a random number generator that has a range based on the number of experienced collisions. It is respectfully submitted, therefore, that claim 5 is clearly patentable in view of the Morrison et al, Frigioni et al, and Kume et al combination of references.

Claims 7 and 8 were rejected under 35 USC 103 as being unpatentable over Morrison et al in view of Frigioni et al, further in view of Rochberger, and still further in view of Kume et al. Applicants respectfully traverse and respectfully direct the Examiner's attention to the above arguments relating to claims 4-6. Based on these

arguments, it is believed that claims 7 and 8 are not obvious in view of Morrison et al, Frigioni et al, Rochberger, and Kume et al combination of references.

Claim 11 was rejected under under 35 USC 103 as being unpatentable over Morrison et al in view of Frigioni et al, further in view of Rochberger and still further in view of Cook et al, US Patent 5,533,016. Applicants respectfully traverse.

Claim 11 depends on claim 10, further specifying that the set of second weights is based on a rarefied neighborhood search. The Examiner cites the Cook et al reference for the proposition that it teaches a rarefied neighborhood search. However, the Cook et al reference deals with identifying a lowest cost ring through a network; not the establishing of routes or sizing of links of the entire network. It is therefore respectfully submitted that claim 11, which depends on claim 10, is not obvious in view of Morrison et al, Frigioni et al, Rochberger, and Cook et al combination of references.

Claims 13 and 14 were rejected under 35 USC 103 as being unpatentable over Morrison et al in view of Frigioni et al. Applicants respectfully traverse.

Claim 13 is an apparatus claim, which inter alia specifies a weight device that generates a set of control weights, one for each link of the network, which is based on a best-neighbor approach. In asserting that Morrison et al teach such a weight device, the Examiner cites col. 6, lines 42-44, and col. 11, line 47 to col. 12, line 10. Applicants respectfully submit that there is no such weight device in Morrison et al, and that the cited passages do not teach or suggest it. Specifically, the col. 6, lines 42-44 passage states:

> In that preferred embodiment, the calculation of network revenue sensitivity utilizes the notion of implied costs which has been taught by Kelly, et al.

Clearly this passage does not describe or suggest any device, and certainly a device that generates a set of control weights for a plurality of links.

The col. 11, line 47 to col. 12, line 10 passage states:

> From (3.2) and the explicit expression for L_s (see, for instance, Kaufman, id.), the following relation is obtained:
>
> $$\frac{\partial B_{sl}}{\partial v_{tl}} = \ \ldots$$
>
> The revenue sensitivity to the offered loads, and equations for the implied costs, may be determined by extending the approach of Kelly

Thorup 1999-0467A

> [F. P. Kelly, "Fixed point models of loss networks," J. Austral. Math. Soc. Ser. B, 31:204-218, 1989] to the multirate case. This extension has been made in a contemporaneous article of the inventors [D. Mitra, J. A. Morrison, and K. G. Ramakrishnan, "Unified approach to multirate ATM network design and optimization," To be published November, 1995] and independently by Farago et al. [A. Farago, S. Blaabjerg, L. Ast, G. Gordos and T. Henk, "A new degree of freedom in ATM network dimensioning: optimizing the logical configuration," IEEE J. Selected Areas in Communications, 13: 1199-1206, September, 1995].
>
> The sensitivity of the revenue W with respect to the offered load ρ_{sr}, when the revenue is calculated from the solution of the fixed point equations, is
>
> $$\frac{\partial W}{\partial \rho_{sr}} = \quad \cdots$$
>
> where c_{sl} (s=1, 2, . . . , S; l=1, 2, . . . , L) are the implied costs.

This passage neither describes no refers to any apparatus, and certainly not to any device that generates weights (or implied costs) for the network links. Therefore, it is respectfully submitted that Morrison et al do not describe a device that generates link weights, and they certainly do not describe a device that generates weights based on a best-neighbor approach. Actually, the Examiner admits that latter – that Morrison et al do not teach the best-neighbor approach, but asserts that Frigioni et al teach that. As demonstrated by the above arguments in connection with claim 1, it is respectfully submitted that the Examiner's assertion is incorrect. In short, at least for the above two reasons, it is respectfully submitted that claim 10 is not obvious in view of the Morrison et al and Frigioni et al combination of references.

As for claim 14, applicants respectfully adopt the arguments made in connection with claim 2 which, in combination with the above arguments pertaining to claim 13, render claim 14 clearly patentable.

The rejections of claim 15 – 19 are respectfully traversed for the reasons expressed in connection with claims 6-9. Combined with the arguments presented in connection with claim 13, it is believed that claims 15-19 are clearly patentable.

Claim 20 is deleted because it is identical to claim 18.

Claim 21 is amended to incorporate therein the limitation of claim 22. This amendment presents a claim that was already before the Examiner and, therefore,

requires no new search. As amended, the claim explicitly specifies use of the best-neighbor algorithm and, therefore, based on the above arguments it is believed that claim 21 is clearly patentable.

Claim 22 is deleted.

Claim 23 objected to. Amended claim 23, which is now in independent form, is believed allowable.

Claims 24-27 are believed allowable for the reasons expressed above.

Turning attention now to the new rejection of claim 21, citing col. 4, lines 1-9 of the Sui et al reference the Examiner states that Sui et al teach a method for controlling traffic flow in a network having N interconnected links, when N is in an integer.

First, although the term "network" is certainly found in the Sui et al reference, including references to radio networks, a search of the text did not reveal any references to network links. Therefore, it is not clear how the Examiner reached the conclusion that Sui et al teaches a network with N interconnected links.

Second, the passage cited by the Examiner states:

> In accordance with the present invention, a method for scheduling transmission of cells through a data switch, preferably a crossbar switch, having a plurality of inputs and outputs, provides a plurality of buffers at each input, each buffer corresponding to an output. The buffers temporarily hold incoming cells. A weight is assigned to each buffer; and buffers are selected according to a weighted matching of inputs and outputs. Finally, cells are transmitted from the selected buffers to the corresponding outputs.

Clearly, this passage addresses a data switch having inputs, outputs, buffers connected to each input, and a switching fabric. There is no mention here of a network, or network links.

It is possible, however, that the Examiner equates the switch to the claimed network, and equates the buffers that connect the plurality of inputs (say, M) of the switch to the MN inputs of the switching fabric (where N is the number of outputs of the switch – see FIG. 1) to the links. It is somewhat strange to equate a switch to a network of interconnected links, the Examiner attributing the weights of the buffers as corresponding to the claimed link weights appears to dictate it.

The Examiner also asserts that Sui et al teach the selecting of weights "being adapted to accept a set of control weights that corresponds to a point on said multi-

dimensional cost function that is or approaches a minimum," citing col. 6, lines 51-62, col. 6, lines 16-27, col. 2, lines 11-25, and col. 3, lines 54-67. Applicants respectfully disagree that the cited passages, or the reference as a whole, teach that which the Examiner asserts. The cited passages, taken in col. order, are presented below in table form, with comments on the right.

Col. 2, lines 11-25 L. Tassiulas, A. Ephremides, "Stability properties of constrained queuing systems and scheduling policies for maximum throughput in multihop radio networks," IEEE Trans. Automatic Control, vol.37, no.12, December 1992, pp.1936-1948, presented a scheduling algorithm using queue lengths as edge weights and choosing a matching with the maximum total weight at each timeslot. The expected queue lengths are bounded, i.e., they do not exceed some bound, assuming of course that no input or output port is overbooked. That is, this is true even if the traffic pattern is non-uniform, and even if any or all ports are loaded arbitrarily close to 100%. Hence, this "maximum weighted matching" algorithm, using queue lengths as weights, achieves 100% throughput.	This passage teaches that the methioned published article describes a scheduling algorithm for a radio network, where queue lengths are considered edge weights. There is NO teaching as to what that algorithm is, and there is no mention of a multi-dimensional cost function.
Col. 3, lines 54-67 The scheduling algorithms used may be based on matching algorithms such as those of the theoretical works cited above, e.g., maximum weighted matching, maximum size (unweighted) matching randomized matchings, etc. The present invention focuses on three QoS features: bandwidth reservations, cell delay guarantees, and fair sharing of unreserved switch capacity in an input-queued switch with no speedup. Several embodiments employing fast, practical, linear-complexity scheduling algorithms are presented which, in simulations, support large amounts of bandwidth reservation (up to 90% of switch capacity) with low delay, facilitate approximate max-min fair sharing of unreserved capacity, and achieve 100% throughput.	The first paragraph of this passage teaches that the scheduling algorithm used is based on matching algorithms previously mentioned. Perhaps it's the algorithm of Tassiulas and Ephremides, but it's not clear; and there is no teaching of what that algorithm is. The second paragraph of this passage promises to present several embodiments, but does not present details of any of the presented algorithms.
Col. 6, lines 51-61 In addition, it is assumed that the switch has the minimum speedup of one, i.e., the fabric speed is equal to the input speed. The motivation is that lower speedup makes the switch more feasible and	The first paragraph of this passage merely addresses the nature of the switch. The second paragraph of this passage teaches that the algorithm must choose a set of

Thorup 1999-0467A

scalable in terms of current technology and costs. A speedup of one also provides the most stringent testing condition for the present invention's algorithms in simulations. Under the above assumptions, a scheduling algorithm must choose a set of cells to transfer at each timeslot, with the main goals of supporting bandwidth reservations and cell delay guarantees. The choice is based on various parameters associated with each VC's queue.	cells to transfer at each time slot. What this teaches is that the algorithm is timeslot-centric, but it does not teach anything about the details of the algorithm.
Col. 7, lines 16-17 Most scheduling algorithms, including those of the present invention, associate a priority or weight $w_{ij} = w(e_{ij})$ with each edge $e_{ij} \in E$. Thus most scheduling algorithms are characterized by two separate choices: deciding how to assign edge weights $w(e_{ij})$, and computing a matching given the weighted graph (G,w). The present invention's contributions derive from judicious choices of edge weights. FIG. 3 is a flowchart illustrating the basic steps of a preferred embodiment of the present invention. First, in step 201, the weights w_{ij} are calculated for each edge e_{ij}. All of the weighting algorithms of the present invention are based at least in part on "credits", discussed further below.	The first paragraph of this passage speaks generally of what scheduling algorithms do, and the fact that contribution of the "present invention" derives from the "judicious choice of edge weights. It does not teach how those weights are chosen, and what makes that choice judicious. The second paragraph of this passage makes reference to FIG. 3, and teaches that the algorithm is based, at least in part, on "credits." It is noted that FIG. 3 directs on to "run algorithm" and "compare with previous matching" not provides no details about the algorithm.

From the above it can be seen that the Sui et al reference does not really address multi-dimensional cost functions. Indeed, the term "cost function" is not even found in the reference. Not surprisingly, the term "multi-dimensional cost function" is also not found and, but it is noted that even the term "multidimensional" (or a variation thereof) is also not found.

Thus, it is respectfully submitted that the claim 21 limitation of a multi-dimensional cost function is not met in the Sui et al reference.

Additionally, as indicated above, claim 21 is amended and, as amended, claim 21 specifies that the point on the multi-dimensional cost function that corresponds to the solution of the network weights is obtained by using the best-neighbor approach. There is not a scintilla of information in the Sui et al reference relative to a best-neighbor

approach. Therefore, it is respectfully submitted that amended claim 21 is clearly not anticipated by Sui et al.

It is again noted that the claim amendments made herein are made to comply with the Examiner's suggestion (relative to claim 23), to correct a 112 antecedence problem, or to combine two claims that have been examined already. Therefore, no additional search is necessary.

In light of the above remarks, it is respectfully submitted that all of the Examiner's objections and rejections have been overcome and that all of the claims are in condition for allowance. Therefore, it is respectfully requested that the amendment be entered, the claims be reconsidered and allowed, and the case pass to Issue.

Respectfully,
Mikkel Thorup
Bernard Fortz

Dated: 12/29/04

By Henry Brendzel

Henry T. Brendzel
Reg. No. 26,844
Phone (973) 467-2025
Fax (973) 467-6589
email brendzel@comcast.net